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ABSTRACT

A sample of 31 male and 31 female seniors participated in a study designed to correlate critical thinking achievement and scholastic aptitude. The subjects completed the "Watson Glaser Critical Thinking Appraisal" (WGCTA), and these scores were correlated with the subjects' scores for the "Preliminary Scholastic Aptitude Test" (PSAT), subject sex, and high school subgroup. The findings indicated strong positive relationships between critical thinking ability and the other variables. The results suggest that the inclusion of critical thinking in the high school curriculum is justified in light of its importance relative to scholastic aptitude and that sex has little bearing on the strength of the relationship between critical thinking ability and scholastic aptitude, making critical thinking instruction equally important for males and females. (RL)

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CORRELATIONS BETWEEN CRITICAL THINKING ACHIEVEMENT AND SCHOLASTIC APTITUDE IN HIGH SCHOOL SENIORS

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CHAPTER I

INTRODUCTION

The skill of critical thinking is held by many in the field of education to be central to the purpose of education itself. And yet little has been done to justify the inclusion of this skill in the curriculum. As with the somewhat nebulous constructs of "intelligence" and "achievement," little is known of the factors which comprise critical thinking and how it interacts with other known constructs. If critical thinking is to be included in the curriculum, then attempts should be made to examine its importance relative to accepted goals of education, such as scholastic aptitude.

Statement of Problem

The Preliminary Scholastic Aptitude Test/National Merit Scholarship Qualifying Test (PSAT), administered to those high school students who are candidates for college entrance, attempts to provide objective measurement of the abilities necessary for success in college work. Because these skills measured by this test are considered to be important by college entrance boards, it seems worthwhile to identify the skills which correlate highly with those measured by the PSAT. The Scholastic Aptitude Test, of which the PSAT is a shortened version, is required for entrance in over eight hundred colleges and universities in the United States.

Philip H. Dubois, Professor of psychology at Washington University, states that the SAT's "mathematical material depends less on formal knowledge and more on logical reasoning and. . . the perception of mathematical relationships." (5:647). In addition, at least part of the Verbal Ability portion of the SAT, the Analogy Test, tests ability to reason. Thus, critical thinking achievement, which also stresses logical reasoning, should correlate positively with scholastic aptitude as measured by the PSAT.

If this positive correlation proves to be true, then the classroom teacher, curriculum committees, and school administrators should be stressing critical thinking skills in the classroom.

Purpose

It was the intent of this study to determine whether or not there is a relationship between critical thinking achievement and scholastic aptitude, as measured by the PSAT. Because relationships between variables may be obscurred by treating the PSAT only as a single score, correlation coefficients were computed separately for the Verbal Ability and Mathematical Ability portions of the test. In addition, for the same reason, correlation coefficients were computed separately for males and females, and for subjects from each of two high schools.

Hypotheses

The following hypotheses and subhypotheses were tested in this study:

1) There will be a positive relationship between critical thinking achievement and scholastic aptitude in high school seniors.

   a) There will be a positive relationship between critical thinking achievement and scholastic aptitude - verbal ability for high school seniors.

   b) There will be a positive relationship between critical thinking achievement and scholastic aptitude - mathematical ability for high school seniors.

2) There will be a positive relationship between critical thinking achievement and scholastic ability in high school senior males.

   a) There will be a positive relationship between critical thinking achievement and scholastic aptitude - verbal ability for high school senior males.

   b) There will be a positive relationship between critical thinking achievement and scholastic aptitude - mathematical ability for high school senior males.

3) There will be a positive relationship between critical thinking achievement and scholastic aptitude in high school senior females.

   a) There will be a positive relationship between critical thinking achievement and scholastic aptitude - verbal ability for high school senior females.

b) There will be a positive relationship between critical thinking achievement and scholastic aptitude - mathematical ability for high school senior females.

Assumptions Underlying the Hypotheses

It was assumed that the scholastic aptitude test score had not changed greatly since administration. The subjects took the PSAT in the 1977-78 school year. Because the PSAT score is stated in the test manual to be predictive of the SAT which is taken in the senior year, this assumption seems well-grounded.

In addition, the researcher assumed that the PSAT was administered to all subjects in the sample under similar conditions. The PSAT test manual provides rigid directions for its administration, including physical conditions, time limits, monitoring, instructions to the student. (18:650)

Definition of Terms

Critical Thinking:

Critical thinking is defined in this study as a composite of abilities including the skills of summarizing, detection of assumptions and faulty arguments, reasoning, hypothesizing, and evaluating. A further elaboration of this definition can be found in Teaching for Thinking, by Louis E. Raths (13).

Scholastic Aptitude:

Scholastic aptitude in the context of this paper is aptitude for academic work at the college level, as measured by the PSAT.

Need for the Study

Although much conjecture and opinion is available about critical thinking in the literature, research concerning critical thinking is fairly limited. The construct is a fairly new one in the field of education, thus most research is concerned with defining and limiting the term by determining how critical thinking differs from other known constructs. Not much research has been conducted correlating critical thinking with scholastic aptitude.

By knowing the importance of critical thinking in relation to scholastic aptitude, proper emphasis can be placed on this skill in teacher education, in in-service education for teachers, and for students in the classroom. If we are to teach this skill in the classroom, we should be able to justify the assumption that it is an important skill.

Limitations of Study

The ability to generalize findings to the population is necessarily limited by the small sample size, and by the fact that the sample was not chosen by true random selection.

The sample chosen does not adequately represent or delineate subcultures in the population, thus restricting ability to generalize to this population.

In addition, only one measure of critical thinking achievement and one measure of scholastic aptitude were used in this study, limiting the researcher's ability to make generalizations to the population regarding other measures or variables.

CHAPTER II

REVIEW OF LITERATURE

Although first identified and studied in 1937 by Edward M. Glaser (9), the construct of critical thinking is still a relatively new one in the field of education. Most research on critical thinking concerns itself with identifying and isolating factors comprising the skill by means of factor analysis in order to define critical thinking more clearly.

In addition, several studies in more recent years concern themselves with the predictive value of critical thinking tests, especially in the fields of science and mathematics. Because the majority of tests designed to measure critical thinking ability are designed for high school and college students, the majority of research concerns itself with this age group.

Factor Analysis of Critical Thinking and Scholastic Aptitude

As a follow-up to a previous study in 1967 by John Follman and David Hernandez, the same researchers conducted a factor analysis study in 1968 using 812 high school students of three socio-economic backgrounds to determine inter-relationships between scholastic aptitude and achievement tests and critical thinking tests and their underlying factorial structures within and across the three socio-economic strata. The hypothesis to be tested was that the subtests of the three tests

would interact differently with the three socio-economic strata represented. The Metropolitan Achievement Tests, Advanced Level (METRO) and the School and College Ability Tests, Form 3B (SCAT) were used to measure scholastic achievement and aptitude, while the Watson Glaser Critical Thinking Appraisal, Form ZM and several other tests were used to measure critical thinking.

Pearson product-moment intercorrelations were computed for nine of the eleven METRO subtests and all other subtests from the three other tests. Principal components factor analysis and Kaiser Verimax rotation was conducted on a correlation matrix of all subtests of all six tests.

Results showed that the Watson Glaser subtests correlated low, but significantly (.20 to .43) with the achievement subtests, and moderate, .53 to .74, with the other Watson Glaser subtests. The means associated with the "non-disadvantaged" whites were consistently higher than the means of the "disadvantaged" integrated negroes and whites, whose means were consistently higher than the means of "disadvantaged" negroes. The researchers concluded that the findings support the hypothesis. Conclusions state that the abilities purportedly measured by the SCAT and METRO subtests differ from those purportedly measured by the Watson Glaser and other critical thinking tests. (7).

In order to identify and isolate the various factors which comprise critical thinking, John Follman, Lawrence Brown, and Eldon Burg conducted a factor analysis of several critical thinking, logical

reasoning, and English subtests in 1969. It was anticipated that the factor analysis would provide evidence of the interrelationships and basic dimensions of the tests from which inferences could be made about the definition of critical thinking, and its relationship between critical thinking and the other variables. (6:12). The null hypothesis was tested.

The data was collected in May, 1966 from students in a junior - level educational psycnology course at Wisconsin State University. Ns ranged from 187 to 211 for the various analyses. Three tests of critical thinking were used, including the Watson Glaser; a logical reasoning test, The Logical Reasoning Test, Form A; and an English test, The Cooperative English Tests: English Expression, Form 1B.

Pearson product-moment intercorrelations were computed to determine subtests' matrices. Principal components factor analysis was used, followed by Kaiser Varimax rotation of all factors with eigenvalues greater than one (6:12). Factors which emerged were recognition of assumptions; judgements if conclusions follow from evidence given; relevance of evidence; fine discriminations about truth or falsity with which inferences follow. A large communality of variance between critical thinking subtests and the English subtests was found. Conclusions stated that critical thinking is not a single general ability, but a composite of different group and specific factors, some very similar to those measured by the English tests. (6:16).

In a study conducted in 1969 by Troxel and Snider (17), total test scores as well as subtest scores for the Test on Understanding

Science, the ACS Cooperative Examination - General Chemistry (Form 1964), and the Watson Glaser Critical Thinking Appraisal were correlated to determine if the tests were measuring the same trait on different tests. The researchers hypothesized that only a concommitant relationship would exist between variables.

The sample consisted of 1333 students in grades ten, eleven, and twelve, drawn from students enrolled in high school chemistry courses. The researchers found a substantial relationship among variables studied - Correlations between the total ASC score and the Watson Glaser total score ranged from .35 to .46, and total test scores of the TOUS and the Watson Glaser correlated from .48 to .65. All correlations were significant at the .01 level. Correlations among subtest scores tend to be less in magnitude than the total score correlations. Conclusions are that this indicates a concommitant relationship among the variables, but does not indicate that the tests measure the same trait. (17:74).

The object of a third study by Follman, Miller, and Hernandez in 1970 was to determine through canonical correlation the maximum relationship between two sets of variables, scholastic aptitude and/or achievement tests vis a vis critical thinking tests (8). Data was derived from a former study by the same researchers (7) in which two critical thinking tests (including the Watson Glaser) were administered to 812 ninth graders in Hillsborough County, Florida, and from a 1966 study by the researchers in which two scholastic aptitude/achievement tests were administered to the same subjects.

In the current study, product-moment correlations were computed among criterion aptitude/achievement subtests, correlations among predictor critical thinking subtests, and intercorrelations among criterion and predictor subtests. Wilkes Lambda and the chi-square approximation for the null hypotheses were computed. Three clear rotated factors were identified, a scholastic aptitude/achievement tests factor, a Watson Glaser Critical Thinking test factor, and a Cornell Critical Thinking test factor. Findings showed that the criterion aptitude/ achievement subtests' intercorrelations were generally high with a median intercorrelation of .72. However the criterion aptitude/ achievement subtests correlated generally low with the predictor critical thinking subtests with a median of .32. The predictor critical thinking subtests intercorrelated moderately strong with a median of .50. All correlations were significant at the .01 level for the N of 812. (8:4) 68% of the variance of scores on the combined critical thinking subtests is accounted for by the variance of the combined achievement/ aptitude subtests. The researchers conclude that the remaining 32% of the variance is partly error variance associated with the critical thinking subtests unreliability, but because the first canonical correlation was so high, .827, the researchers conclude that "much of the critical thinking activity is measured by the achievement/aptitude tests. However, if one is interested in developing and enhancing critical thinking ability as a specific learning objective, he can have confidence that the critical thinking tests do test some ability

other than achievement." (8.5).

Predicting Achievement/Aptitude From Critical Thinking

A study conducted in 1965 by Leo Shatin and David Opdyke at the New Jersey College of Medicine and Dentistry used seventy-two first-year students at the college to determine correlates of critical thinking, a skill the researchers felt is necessary for medical training, and thus necessary for the medical faculty to evaluate in prospective students. (14) The researchers hypothesized that critical thinking would correlate positively with abilities evaluated by the Medical College Admissions Test (MCAT).

Results of the Watson Glaser Critical Thinking Appraisal were correlated, using the Pearson product-moment correlation, with among other factors, the MCAT.

Results showed that the WGCTA correlated at a low but significant level ($r = .37$, $p < .01$) with the MCAT, and correlated similarly with the scores on the Verbal Ability subtest ($r = .32$, $p < .01$), and the General Ability subtest ($r = .29$, $p < .02$). The researchers conclude that because the WGCTA did not correlate highly with the MCAT, it has little predictive value for the basic medical science curriculum. Because the authors feel that critical thinking in one's daily life or in political issues is not necessarily allied to critical thinking in scientific laboratories, an instrument for the appraisal of critical thinking must be specifically developed for the medical basic science curriculum. (14: 791).

Critical thinking ability was one factor correlated with success in freshman biology at New York University by Alice Jenkins in a 1966 study. The purpose of the investigation was to determine the relationship of certain measurable factors to academic success in this subject, and to determine which possible combination of these factors, as determined by test scores, would best predict success. (11).

The Watson Glaser Critical Thinking Appraisal was administered to the subjects, all freshman students who completed the first semester of General Biology at Alabama Agricultural and Mechanical College in Fall, 1961. Correlation coefficients were calculated for each of the variables (California Short-Form Test of Mental Maturity, the Iowa Silent Reading Test, the WGCTA, and the Sequential Tests of Educational Progress, Science) and the criterion, success in freshman biology. Intercorrelations were calculated among the four test scores, and a regression equation was derived by the Doolittle method. (11.1).

Findings indicated critical thinking ability correlated with the criterion variable .29. However, a combination of reading ability (.33), mental ability (.24), and critical thinking produced a fairly high correlation coefficient (.72). Based on these findings, the researcher concluded that although rank in high school graduating class was the best single predictor of academic success in Freshman biology, reading ability, critical thinking, and mental ability can be combined to provide a fairly accurate prediction. The study

recommends that the WGCTA be administered to incoming freshmen registering in the department of Biology. (11:2).

In a correlational study in 1966 designed to determine predictors of achievement in ninth grade Modern Algebra students, Sister Pierre Marie Dirr administered a series of cognitive tests, including the WGCTA, to the subjects. (No N given). Separate correlations were computed for males and females. Findings indicated that, from multiple regression analysis, one half of the variance in Modern Algebra achievement is accounted for by the possession of general (I.Q.) and specific cognitive abilities (including critical thinking). For girls, the variables did distinguish the high achievers from the low, while for boys, there were significant differences in all of the variables, with the exception of two subtests. (4:1).

The researcher concludes, however, that critical thinking is positively correlated with success in Modern Algebra, and recommends that because critical thinking as a measurable factor is relatively new in education, it needs to be more fully explored in its relationship to the criterion, by the utilization of measuring devices that delineate the multi-facets of this cognitive ability. (4:2).

In order to determine what factors can predict critical thinking, scholastic achievement, and logical reasoning ability, Clyde Skelly Ph.D., conducted a study in 1961 utilizing the entire student body of the Portsmouth, New Hampshire High School as subjects. The subjects were given tests of intelligence and divergent thinking, and on the

basis of the results, the following subgroups were isolated: Highly Intelligent, Highly Divergent Thinking (N=130); Highly Intelligent, Not Divergent Thinking (N=89); Low Intelligence, Highly Divergent Thinking (N=70) (15:1).

The three groups were administered a battery of nine tests, including the WGCTA. For each of the nine variables, chi-square analysis was used to test the homogeneity of performance of the three groups, and for males and females in each group. Distinctive differences were found among the three groups on all variables except one. Critical thinking ability rose as Intelligence and Divergent Thinking level rose, although it was more closely related to Intelligence. Intelligence level rather than Divergent Thinking level seems to be the important factor in determining high levels of critical thinking ability was the conclusion of the researcher. (15:2).

Using students enrolled in the teacher education program at North Texas University during the 1964-65 school year, Robert Smith conducted a causal-comparative study analyzing scores made on selected standardized admissions tests for four groups of education majors; elementary majors, secondary majors, non-affiliate majors, and the national norms for college juniors. Among the test scores compared for the four groups was the Watson Glaser Critical Thinking Appraisal. The null hypothesis was used to test the mean scores of the four groups. Findings indicated there was no significant difference between the mean scores of the elementary majors on each of the standardized tests

and the mean scores of the secondary majors, the non-affiliate group, or the national norms. The researcher concludes that there is no discernable difference in abilities among the four groups, and recommends that a longitudinal study be conducted to indicate correlations between success in student teaching and scores made at the junior level on the selected admissions tests for prediction purposes. (16:2).

Critical thinking ability was one variable used to identify similarities or differences between successful and unsuccessful college level beginning shorthand students and successful and unsuccessful college level beginning level transcription students at three junior colleges, one four year college, and three universities in Michigan by Lefterie M. Moskovis in 1967. A total of 82 successful and 61 unsuccessful beginning shorthand students were identified; a total of 67 successful and 64 unsuccessful beginning transcription students were identified. Data was obtained from five standardized tests, including the Watson Glaser. In order to test the null hypothesis, three statistical techniques were used to test the significance of any differences that were identified between the successful and unsuccessful students. The student's t-test and the point-biserial correlation technique were used to analyze the continuous variables; the chi-square technique was used to analyze the discrete variables. (12:1).

A number of significant differences were found between successful and unsuccessful college level beginning shorthand students, including critical thinking ($p < .001$). There were few significant differences

between college level beginning transcription students, but one of those variables identified was critical thinking (.01 level of significance). Thus, critical thinking appears to be a predictor for success in college level beginning shorthand and transcription courses. (12).

Summary

The four studies designed to estimate the nature and magnitude of the interrelationships between the Watson Glaser Critical Thinking Appraisal and other tests by use of factor analysis found generally low correlations. (7,6,17,8). Critical thinking tests were found to measure factors other than those measured by other instruments studied. The low correlations between variables studied could be accounted for, in part, by the fact that due to the small number of items, part scores on the Watson Glaser Critical Thinking Test are not reliable. (19). Levels of significance for these factor analysis studies were omitted in many cases (6,7). In addition, hypotheses are often implied through "Objectives of the Study," and not clearly stated. Factors analyzed included scholastic aptitude and achievement (7, 8), logical reasoning (6), English ability (6), and general chemistry ability (17).

Studies using critical thinking ability to predict future achievement or success in a subject area vary as to their conclusions. (14, 11,15,16,12,4). In the majority of the studies, the criterion variable is achievement in math or science (4,11,14), although critical thinking

ability has been used to attempt to predict success in college level shorthand and transcription courses (12), to attempt to predict and distinguish major fields of study in education majors (16), and to distinguish highly intelligent and divergent thinkers from low intelligent, non-divergent thinkers. (15). No studies were found correlating scholastic aptitude or achievement with critical thinking ability as a whole.

Correlations between critical thinking and the criterion variables were generally low but significant, however a combination of critical thinking and reading ability or mental ability tends to correlate more strongly with the criterion variable studied (4,11). In all cases, researchers recommend that other tests of critical thinking be developed specifically for various content areas.

CHAPTER III

METHODS AND PROCEDURES

Description of Subjects and Selection Methods

The population sampled in this study included current high school seniors in the Phoenix metropolitan and outlying areas who had taken the Preliminary Scholastic Aptitude Test in their junior year (the 1977-78 school year). In order to sample this population, 62 high school seniors were chosen in a random cluster sample from two Phoenix area high schools in two separate school districts. High School "A" is located in an upper middleclass suburb of the city and has a student body of about 2300. High School "B", located in a small rural town outside of the city, has about 1058 students. Care was taken to insure that enough males and females from the population were chosen to allow for additional correlations of these subgroups. In addition, enough students were chosen from each high school for separate correlations (High School "AX"N= 31, High School "BX"N-31). Subjects were chosen at random from the PSAT/NMSQT computer print-out score sheet.

All subjects were seniors and the current median age (at the time of the study) was 17.3 for the High School "A", and 17.4 for High School "B". Median grade point average for subjects at each of the high schools was 3.5 (A-,B+). All students had taken the PSAT in

their junior year (the 1977-78 school year) at their respective high schools.

Description of Instruments

The Preliminary Scholastic Aptitude Test/National Merit Scholarship Qualifying Test (PSAT) is a practice examination published by the College Entrance Examination Board, similar to the actual Scholastic Aptitude Test (SAT). It is administered in October for guidance purposes to those high school juniors who intend to take the SAT at a later time. The SAT is an objective examination designed to appraise a college candidate's aptitude for academic work at the college level. To anticipate the SAT score from the PSAT score, it is necessary to multiply the two-digit PSAT score by 10 and add 20 to the result.

The test is divided into two areas: Verbal Ability and Mathematical Ability, and separate scores are reported for each section. Included within the Verbal Ability portion are tests of antonyms, synonyms, sentence completion, analogy, reading comprehension, and general understanding. Included in the Mathematical ability portion are tests of elementary and applied mathematics, and data sufficiency. This last test includes logical reasoning and ability to detect assumptions. Scores range from 20 to 80 on each of the two portions of the test.

Internal consistency reliability coefficients are regularly about .91 for PSAT- Verbal, and .90 for PSAT- Mathematics for recent forms. Alternate form coefficients of correlation are provided -- .89 for PSAT- Verbal, and .88 for PSAT- Mathematics (18.649). Intercorrela-

tion between Verbal and Mathematics portions has been increasing to about .67 in 1969. Typical predictive validity for PSAT- Verbal is .39, for PSAT- Mathematics, .33. Multiple correlation with high school record is about .62. (5:647).

The Watson Glaser Critical Thinking Appraisal is used to measure achievement in critical thinking skills for grades nine through sixteen. The appraisal consists of five subtests which measure inference (Test I), recognition of assumptions (Test II), deduction (Test III), interpretation (Test IV), and evaluating arguments (Test V). There are one hundred items on the test; raw score is the number of correct items out of one hundred. Scores can range from 1 to 100. The Watson-Glaser is a group test, and directions for administration recommend 50 minutes for the 100 items.

There are two forms of the test, YM and ZM, considered to be equivalent, although median item discrimination indexes and reliability coefficients, computed by the odd-even split-half method, corrected by the Spearman- Brown formula, range from .85 to .87 on Form YM, and .77 to .83 on Form ZM. Standard errors of measurement computed from corrected split- half reliability coefficients range from 3.7 to 4.3 for Form YM, and from 4.4 to 4.6 for Form ZM. Reliability data is supplied by the authors, and is computed from seven sample groups representing various age group populations, grade nine through college seniors. The authors do not endorse the use of part- scores because of their low reliability. (19). Because

scores appear to change as individuals grow older, one critic, John O. Crites, questions the internal consistency of the test for older individuals, and feels a need for test-retest coefficients. (3).

No predictive validity coefficients are reported, but internal consistency for high school students is high, and the concurrent validity is acceptable. Evidence of construct validity indicate relatively low subtest intercorrelation coefficients, ranging from .21 to .50. This indicates that relatively distinctive abilities are being measured. Evidence of the substantial relationship of the various subtests to the appraisal as a whole is found in the correlations of .56 to .79 between the various subtests and the total test. (19).

Data Collection Methods

The following data was collected for each subject in the sample:

a) PSAT score

b) Watson- Glaser Critical Thinking Appraisal score

c) age

d) sex

e) G.P.A.

f) school

PSAT scores for each student in the sample were obtained from the test score computer print- out sheet through the head guidance counselor at the two high schools. A Verbal Ability score and a Mathematical score was obtained for each student. The same computer print- out sheet also supplied each subject's G.P.A.

The Watson Glaser Critical Thinking Appraisal (Form YM) was administered to subjects at both high schools under similar conditions within the same week. Abbreviated directions for the test were read aloud from the test amnual and subjects were allowed fifty minutes to work on the test. Students were told when half of the test time remained. Care was taken to provide an amenable testing situation -- i.e. appropriate space and lighting, quiet conditions, comfortable physical surroundings.

Subjects were told only that they were to take this test as a follow- up to the PSAT that they had taken previously, and that their score would be available to them if desired.

The Watson- Glaser tests were scored twice by hand by two individual scorers. Only the total score was computed for each subject.

Research Design and Procedures

Pearson product- moment correlation coefficients were computed between the following variables:

Total Sample

a) WGCTA Total Score -- PSAT Total Score

b) WGCTA Total Score -- PSAT - Verbal Ability

c) WGCTA Total Score -- PSAT- Mathematical Ability

High School "A"

a) WGCTA Total Score -- PSAT Total Score

b) WGCTA Total Score -- PSAT- Verbal Ability

c) WGCTS Total Score -- PSAT- Mathematical Ability

High School "B"

a) WGCTA Total Score -- PSAT Total Score

b) WGCTA Total Score -- PSAT - Verbal Ability

c) WGCTA Total Score -- PSAT- Mathematical Ability

Males

a) WGCTA Total Score -- PSAT Total Score

b) WGCTA Total Score -- PSAT- Verbal Ability

c) WGCTA Total Score -- PSAT- Mathematical Ability

Females

a) WGCTA Total Score -- PSAT Total Score

b) WGCTA Total Score -- PSAT- Verbal Ability

c) WGCTA Total Score -- PSAT- Mathematical Ability

Watson Glaser subtests were not correlated separately with the PSAT scores because, as stated in the test manual (WGCTA), part-scores are not reliable, probably due to the small number of items in each subtest. (19).

Acceptable level of significance for all correlations was set at the .05 level. Levels of significance were determined through the use of the Pearson r Table for determining levels of significance. Degrees of freedom = N - 2.

CHAPTER IV

FINDINGS

Each Pearson product- moment correlation coefficient computed in this study was tested for level of significance by entering degrees of freedom and correlation coefficient in the Pearson r level of significance table. Degree of freedom = N - 2.

For ease in reading the following Table, the following symbols will be used:

N = number of sample

r = Pearson product- moment correlation coefficient

WGCTA - Watson Glaser Critical Thinking Appraisal

PSAT - Preliminary Scholastic Aptitude Test

PSAT-V- Preliminary Scholastic Aptitude Test, Verbal Ability

PSAT-M- Preliminary Scholastic Aptitude Test, Mathematical Ability

Considering correlations between the WGCTA and PSAT for the total sample (N= 62), the strongest positive relationship was found to exist between the WGCTA and PSAT total score (r = .83). Correlations between the WGCTA and the PSAT Verbal and Mathematical Ability subtests also correlated highly positive, with coefficients of .76 and .81 respectively. The null hypothesis was rejected at the .01 level for each of the hypotheses tested in this study, a higher level than the .05 level originally set by this researcher.

With subjects from High School "A" (N=31), the strongest positive relationship was that between the WGCTA and the PSAT total score (r= .84). Correlations between the WGCTA and PSAT- Verbal Ability and the WGCTA and the PSAT- Mathematical Ability score were .75 and .82 respectively. The null hypothesis was rejected at the .01 level. In High School "B" (N= 31), similar findings resulted. The WGCTA correlated with the PSAT total score in a strong positive relationship (r= .79). PSAT subtest scores, Verbal and Mathematical, correlated with the WGCTA .74 and .75 respectively. ($p < .01$). These findings support hypothesis #1 and its subhypotheses (a) and (b), as do the findings for the total sample group.

Correlations between the WGCTA and PSAT for males (N= 31) was highly significant and positive. The strongest positive relationship occurred between the PSAT total score (r= .83). Correlations between the WGCTA and the Verbal and Mathematical subtests scores were .77 and .83 ($p < .01$). These findings support the hypothesis #2 and its subhypotheses.

For females (N= 31), correlation of scores on the WGCTA and the PSAT total score indicate a very strong positive relationship (r= .75), as did the correlation of the same group's scores on the WGCTA and the PSAT Mathematical subtest (r= .75). There was a moderately strong positive relationship between the WGCTA and the PSAT Verbal Ability subtest for this group (r= .66). All findings were

significant at the .01 level. These findings support hypothesis #3 and its subhypotheses (a) and (b).

Thus, all hypotheses established for this project were accepted at a level of significance at or above the .01 level. Findings indicated that there was a positive relationship between critical thinking ability and scholastic aptitude in these high school seniors. Findings also supported the hypothesis that there is a positive relationship between critical thinking ability and scholastic aptitude in high school senior males, and the hypothesis that there is a positive relationship between critical thinking ability and scholastic aptitude in high school senior females.

TABLE I. PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS FOR THE WGCTA AND THE PSAT

Group	N	WG and PSAT- T	WG and PSAT- V	WG and PSAT- M
Total Sample	62	.83**	.76**	.81**
High School A	31	.84*	.75*	.82*
High School B	31	.79*	.74*	.75*
Males	31	.83*	.77*	.82*
Females	31	.75*	.66*	.75*

** r required at .01 level of significance with 60 df = .325
* r required at .01 level of significance with 29 df = .456

The findings of this study correlating critical thinking with scholastic aptitude do not conflict with previous studies, since past research has been concerned with predicting success in a particular subject area from WGCTA scores. Low correlations between critical thinking subtest scores and scholastic aptitude subtest scores in factor analysis studies indicate that these tests represent separate factors. Because these studies analyzed part- scores, the low correlations found between the WGCTA and scholastic aptitude subtests do not conflict with the findings in this study.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

Summary

The Preliminary Scholastic Aptitude Test/National Merit Scholarship qualifying Test is administered to those high school students who are candidates for college entrance, and attempts to measure those abilities necessary for success in college- level work. Because these skills are considered to be important by educators, it seems worthwhile to identify the skills which correlate highly with those measured by the PSAT. If there is a positive relationship between critical thinking ability and scholastic aptitude, then educators should feel justified in including critical thinking in the curriculum.

The purpose of this study was to discover whether or not there is a positive relationship between critical thinking ability and the scholastic aptitude, as measured by the PSAT.

Three hypotheses with sub-hypotheses were tested:

1) There will be a positive relationship between critical thinking ability and scholastic aptitude in high school seniors.
   a) There will be a positive relationship between critical thinking ability and scholastic aptitude - verbal ability in high school seniors.
   b) There will be a positive relationship between critical thinking ability and scholastic aptitude - Mathematical ability in high school seniors.

2) There will be a positive relationship between critical thinking ability and scholastic aptitude in high school senior males.
   a) There will be a positive relationship between critical thinking ability and scholastic aptitude - verbal ability and scholastic aptitude - verbal ability in high school senior males.
   b) There will be a positive relationship between critical thinking ability and scholastic aptitude - mathematical ability in high school senior males.
3) There will be a positive relationship between critical thinking ability and scholastic aptitude in high school senior females.
   a) There will be a positive relationship between critical thinking ability and scholastic aptitude - verbal ability for high school senior females.
   b) There will a positive relationship between critical thinking ability and scholastic aptitude - mathematical ability in high school senior females.

The Watson Glaser Critical Thinking Appraisal was administered to a sample of 31 males and 31 females chosen from two high schools. These scores were correlated, using the Pearson product-moment technique, with PSAT total, Verbal, and Math scores, as found on the computer printout sheet at the high school guidance offices.

In addition to the correlations computed for the total sample, additional correlations were computed for males and females, and for high school subgroups.

Findings indicate a strong positive relationship between variables in all cases, significant at the .01 level.

Conclusions

The following conclusions can be made from the results of this study:

a) The inclusion of critical thinking in the curriculum is justified in light of its importance relative to scholastic aptitude

b) Sex has little bearing on the strength of the relationship between critical thinking ability and scholastic aptitude, and thus critical thinking instruction is equally as important for males and females.

Recommendations

It is strongly recommended that further research be conducted relative to the construct of critical thinking. Not enough is known about what actually comprises this important construct, and until we know this and have data to support our theories, valid decisions cannot be made as to the actual skills to be taught in the classroom.

Results of this study can be better generalized to the population if further research is done delineating sub-cultural groups, socio-economic levels, and age groups of subjects.

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